transistor bistable

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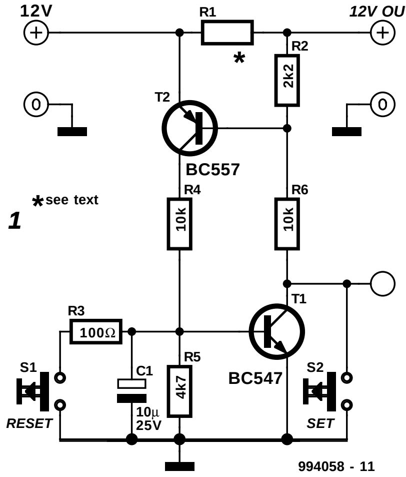

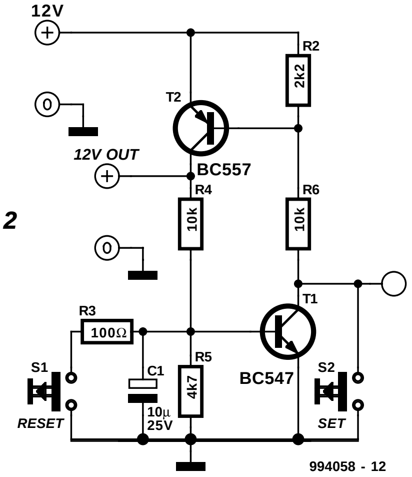

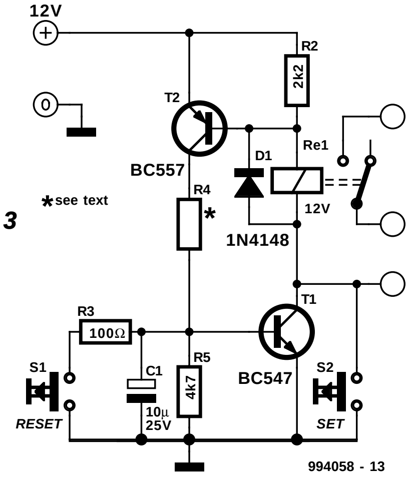

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The diagram in Figure 1 shows a well-known bistable circuit that is often used (without the switches) in protection circuits in various equipment. In the quiescent state, the bistable draws no current and is set only when the U_{BE} of T_2 is exceeded. At what level of current this happens is determined by the value of resistor R_1. Both transistors are then on, so that the collector potential of T_1 goes to U_b, and that of T_2 to earth. The collector of T2 then connects the control input of a device at output terminals PC_3, PC_4 to earth and thus in fact switches off the direct voltage.

Normally, it is assumed that the load current circuit must be opened before the bistable can be reset after an overcurrent. This is usually effected by a relevant switch contact or electronic device. It is, however, fairly simple to set and reset the bistable without interfering with the load circuit by placing the switch as shown. The switch only carries the control current of the bistable.

When the circuit is reduced to its essentials as shown in Figure 2, it becomes a general-purpose multivibrator that can provide a much greater current than a standard logic IC, provided suitable transistors are used. The multivibrator can work from a wide range of operating voltages. Capacitor C_1 ensures that the correct pulse/pause ratio is maintained at switch-on.

If R_3 is replaced by a relay solenoid, the circuit functions as a bistable relay which, after the circuit has been set with switch S_2, remains stable until the bistable is switched off with switch S_1. With other components as specified, the relay should have a high-resistance coil: 900–1000 Ω in the case of 12 V types, and around 3.5 kΩ for 24 V types. The value of R_2 should be of the same order, but it is not particularly critical.

If only a power relay with low-resistance solenoid is available, the transistors and resistors R_1, R_2, and R_4, must be adapted to the current demand of the relay. Freewheeling diode D_1 may be a Type 1N4148 in case of a small relay, but when the relay current is greater than about 100 mA, it is advisable to use a Type 1N4001.

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